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Information Communication Technology in Schools in African Countries and Factors that Promote Digital Divide

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Abstract
Although globalization tends to paint a fascinating picture of the world where all people are aided by modern-day communication technologies to integrate into the global information village, the digital divide has distorted what intended to follow as a sequence across all regions of the developed and underdeveloped world. Nonetheless, the worldwide recognition and acceptance of the importance of ICT in championing development across different works live and uniting all peoples into one global community has not received any known objections. The worldwide attestation to the relevance of ICT in permeating, championing, and innovating human and material resources cannot find institutional usefulness outside the boundaries of the education system. If schools in African countries are designed like their Western counterparts to tap from the level of information flow orchestrated by ICT, the pursuit of an information rich society where knowledge is placed within the reach of every citizen will be realizable. The position of the Internet in the free flow and dissemination of information depends on the realization of ICT infrastructure. The inevitability of ICT mediation in education and schools has given rise to the need to equip schools with computers and enable free internet access for members of the school community. The provision of ICT will serve a gateway to efficient and effective education systems anchored in research findings that 'technology-mediated learning is advantageous to students, teachers, and schools.' Current evidence shows African countries to be on the wrong side of digital diffusion as their schools and pupils are still confronted by the digital divide. Despite a growing integration of communities with mobile network technologies, a digital divide still cuts across schools in African countries, equally damaging the reputation of the continent which has not been able to direct its human and material resources where it matters. The inability of the countries of Africa to meaningfully integrate ICT into school curriculum increases the worries of digital divide, which has created a demarcation between education standards in Africa and developed countries. It identifies factors that promote digital divides in African schools to hang on human and material capacities. These two factors happen to be manmade for lack of due diligence in the race for information freedom. African countries need to modernize its education pedagogy to accommodate ICT. For that to happen, countries have to come up with alternative ideas capable of circumventing the high cost of computers and broadband internet access to bridge the digital divide in schools. The options that can solve ICT problems in schools in African countries hinges on types of digital technology utilized by students as mechanisms for bridging the digital divide. Hence, ICT in the 21st century holds education to ransom with pedagogy anchored on technology as the only solution. Therefore, digital diffusion in all schools merits global concern and the use of every possible methodology as a welcome initiative.
Keywords: Information Communication Technology, Digital Divide, Digital Inclusion, Digital Diffusion, Internet Access

Introduction

Both information communication technology (ICT) and the concept of a digital divide arose from the transition of traditional sources of information to digital communication technology as a major information warehouse. This trend is championed by the transformational 'on the spot' characteristic of ICT channel of information delivery. Hence, there was a worldwide shift from traditional sources of information to a more efficient and dependable ICT such that school authorities and government agencies agree that information communication technology supports the teaching-learning process. Studies show tremendous outcomes with the subject attracting the attention of education policymakers (Thierer, 2000; Rosen and Well, 1995).

Learning technologies involving the use of information communication technology has been regarded as a welcome innovation within the field of education and described as improving teaching-learning process and the workforce (Aduwa-Ogiegbaen and Iyamu, 2005). Efforts to equip schools with adequate technologies that support and advance instructional materials has been on the increase (Fitzgerald and Warner, 1996). Projects aimed at equipping schools with relevant information communication technology infrastructures get approval and are initiated regularly to enable every student benefit from the advantages of information communication technology. As a result, public schools in the U.S. now enjoy computer and internet access, thereby rendering the digital divide insignificant among students.

Burnett (1994), acknowledged integrating technology with instructional process as a positive outcome. Presently, based on Pew Research Center publications that all public schools in the U.S. are currently equipped

with computers and enjoy 100% internet access reflects Burnett's ideas. The advancement of schools with technology in developed countries results from research and expert opinions on the importance of technology integrated learning as an effective tool in combating the digital divide. Aduwa-Ogiegbaen and Iyamu (2005), insist that developed nations this past decade could not have uncovered the usefulness of ICT based instructional aids without the staggering amount of research and publication on the subject. As a result, government agencies and different groups in developed countries took advantage of research outcomes to make schools ICT compliant. Such compliance is overwhelming that while Harper (1987) thinks it is difficult to keep track of computer supplies available in American schools.

On the other hand, the provision of computers and internet access has bridged the digital divide in public schools in the United States and other developed countries. In a survey conducted by Becker (1986), results reveal a comprehensive integration of computers in both public and non-public schools in the United States. This is thanks to digital inclusion programs, which have enabled the diffusion of every child in public schools by making available computer and access to internet services. This has become a trend across technologically advanced nations and a landmark to recognize schools in the developed countries and their underdeveloped counterparts. African governments and collaborators establish homegrown programs that arrest problems of digital divide and harness advantages of ICT based on regional needs.

Britain, Canada and other industrialized nations have adopted different digital inclusion programs similar with those in place in the United States, aimed at diffusing digital divides through the equipment of public schools with requisite ICT hardware, soft wares and skilled manpower. In a bid to enforces digital diffusion, Britain, through the Local Education Authorities (LEA) provide computers in schools as well as the sum of $325 million spread over time (Visscher et al., 2003). What this suggests to underdeveloped countries concurs with expert's opinions that even the developed countries could not achieve such 'across-the-nation' digital inclusion in public schools without government intervention and financial involvement.

In a similar effort, African countries, despite facing numerous challenges, have accepted and commenced programs aimed at equipping schools with basic information communication technology. This planned effort has seen African countries forge individual and collaborative agendas such as 'school library automation' projects in various schools and higher institutions. A good example in Africa is the 'Ugandan Interconnectivity Program "School Net"' aimed at executing educational technology throughout Uganda (Carlson and Firpo, 2001) and Nigeria's 'Education Trust Fund' for 'Library Intervention' in the arears of ICT. Such initiatives to connect schools throughout Uganda with functional ICT also paves the way for digital diffusion. The effort is vital in bridging the digital divide in Africa for most countries, and to an extent, narrow the widening gap in ICT compliance. However, the question remains, will these projects survive or succeed given the track record of failed and abandoned projects among successive governments in Africa?

Digital divide and ICT has unavoidable consequences for student's information seeking behaviors as explained by Kulthau. Psychological and physiological implications of a digital divide between students attending schools with functional ICT and students in poorly equipped schools affect confidence and motivated to seek information as the uncertainty level of the latter group of students is sure to increase due to scarce and limited possibilities of needs satisfaction (Kulthaus, 1994). The need for digital inclusion and ICT compliant citizenry has replaced the idea that 'information is for the rich' and agrees completely with Aduwa-Ogiegbaen and Iyamu (2005) that "information is not a luxury but a necessity for development."

This transformation is crucial towards building an egalitarian society where everyone is treated equally regardless of sex, gender, age and race. A wake-up call indeed for developing countries to stand up to their responsibilities of building an information rich society where their citizens enjoy basic amenities once regarded as 'luxury' by myopic minds and anti-elements of nation building. Students must be enabled to utilize ICT as a channel of information and enjoy the advantages deprived by digital divide. Because, "in this digital age access to information on the internet is part of citizenship entitlement" (Murdock, 2016).

Does Schools in African Countries Need ICT?

Information communication technology is a right, not a privilege, regardless of opposing ideas. It is essential for building an egalitarian society and mandatory for national building. As the problems of the digital divide take different forms and pose numerous challenges, ICT in schools reduces the burden (with great margin) for school goers. The exponential growth of information communication technology is causing innovation across business industries and educational institutions, as well as initiating new challenges such as the pro-ICT digital divide.

However, several ameliorating measures are in place providing solutions to digital divide and promoting ICT compliance for effective information dissemination. Just as Anderson (1999) suggests, technology provides the opportunity for discovering, developing and championing resources and talents within people and institutions such as schools. Therefore, schools that integrate ICT in education heighten the expectations of an information rich society (Vanderlinde and Van Braak, 2010). Information communication technology in school's increases access to information and education resources.

There is need for an ICT policy and blueprint detailing why schools in underdeveloped countries urgently need ICT. The advantages of full computerization and internet access in public schools enjoyed by students in developed countries of the U.S., Canada and Britain should be elaborated on. The need for strategic planning is paramount to achieving the unreserved compliance of all stakeholders involved. The philosophy should hint on how ICT could improve and enhance the benefits of teaching and learning (Malapile and Keengwe, 2013).

Unfortunately, African countries in the past decades have witnessed numerous and different political and economic challenges that have put the continent in a state of grave consequence. The political turmoil arouses a sense of disunity among people that encourages and sustains the digital divide. Governments in Africa such as Rwandan, Burundi, Liberia and Sierra-Leon, South African, and Nigeria/Biafra that have experienced genocides, apartheid and pogrom can erase such negative memories with digital inclusion programs that enables diffusion of all school children. Whereas, lack of computers in over 90% public schools in Nigeria (Okebukola, 1997) attests to the need for revised pedagogy in most African countries' education system.

Without such revision of education policies, students in African schools will not be able to take full advantage of emerging technologies, and will likely to always perform lower and behind their Western counterparts in developed nations. However, Aduwa-Ogiegbaen and Iyamu (2005) claims that the political conditions in most African countries in past decades suggests a backward trend. Such that efforts to pace-up with development saw Nigeria in 1998 enacting a Policy on Computer Education (p.2), which although initiated, was never implemented to fruitful realization (Okebukola, 1997).

The backward position of African countries in terms of technology advancement reflects in her education system and school educational infrastructures. The implication on the continent is a total or increased blackout of potentials and development which starts no place other than in schools. The glaring conditions and quality of schools abroad when compared with those in African countries calls for immediate mandatory reevaluation and complete overhaul of all mediums of educational delivery to accommodate and integrate ICT mediation. African countries cannot make any major break-through, both internally and on the international scene, as long as ICT keeps pervading virtually every aspect of human endeavor shaping businesses, education, healthcare, politics, management and economy (Aduwa-Ogiegbaen and Iyamu, 2005).

In fact, the effect on Africa's future indicates catastrophe, because the schools that are supposed to train students lack the requisite amenities (ICT) and technological knowhow paramount to building nations capable of facing the challenges of innovation and development in a fast paced information age. ICT adoption in schools should be viewed as an innovation with beneficial outcomes (Oguz, 2016). Aduwa-Ogiegbaen and Iyamu (2005) lament the quality of graduates from African countries with emphasis on Nigerian graduates as they are not properly trained and thereby cannot take advantage of new opportunities unfolding. Hence, the concept of 'uneducated graduate' explains the plight of students produced in African schools.

African countries need to reassess their educational values and practices in order to accommodate ICT and present a compliant pedagogy that empowers schools in producing capable students. The need for schools to adopt modern measures that produce proactive individuals based on institutional demand for a technology compliant workforce demands a reversal of the idea that African graduates were unproductive and poorly trained (Dabalen and Oni, 2001). This impression could be corrected when schools are adequately equipped with functional computers and internet access and instructional infrastructure modeled with ICT.

Until African countries adopt and implement mandatory ICT policies in schools, international communities currently enjoying the boundless benefits that comes with information revolution will continue to outperform schools in African countries (Mariscal, 2005), and outclass the African child. Such economic, political, social and democratic opportunities enjoyed by developed countries in all sectors of life, including schools, will have no reality for the common African child without the means to travel abroad. ICT is a modern infrastructure without which innovative changes for certain administrative functions will affect schools in the arears of communication and information storage, both institutional and for student records.

Information synchrony and information retrieval are other areas the old documentation systems lacks the quality of efficiency ascribed to information communication technology. Mariscal (2005) cautions that equipping schools with ICT has consequences for countries seeking to address economic, political and democratic growth. The socio-economic and political conditions of most African countries this past decade when compared with the current social media trending and the active participation of students all over Africa, show signs of national awakening and involvement of African students in global affairs. This also confirms Mariscal's findings on how ICT in schools contributes to countries national growth (p.410).

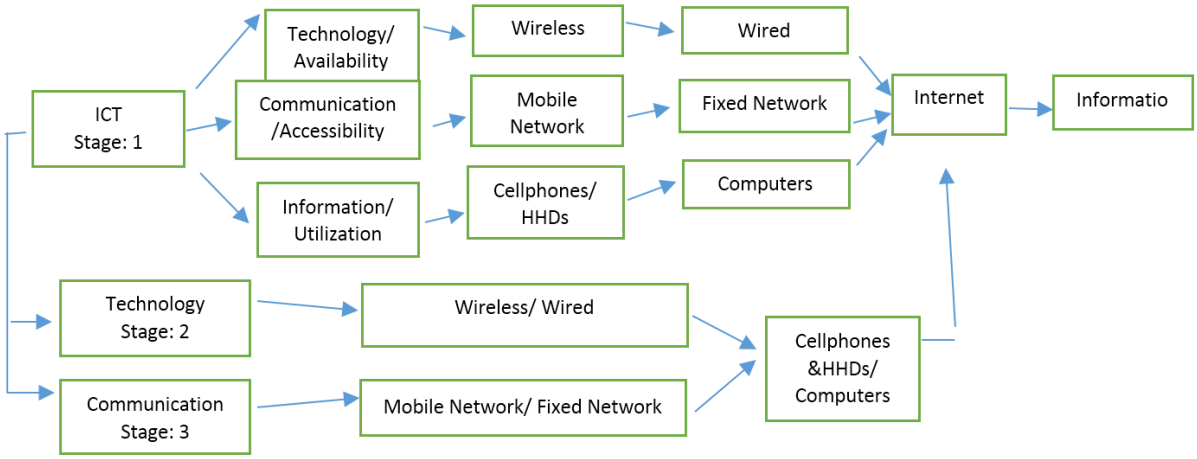
The Nature of ICT

This paper uses the aid of a conceptual model to explain the three major components of ICT and their corresponding evaluators namely: information, communication and technology and availability, accessibility and utilization, respectively. Although ICT is often perceived as one word, the model brakes down into three

components in progression. Basically, the aim is to explain through use of the model that information can be utilized only if communication is accessible and if technology is available. This explanation is the basic massage of this model. As the study diagram shows, an investigator who chooses to investigate the 'accessibility of technology or availability of communication' is likely to encounter daunting task than one studying the 'availability of technology or accessibility of communication.'

The model intends to benefit studies by ascribing the right evaluator to each component. It follows the idea that something would have to be available for it to be accessed. These categories function as tools in making technical decisions (Sink, Jackson, Boham and Shockley, 2004). Thus, justifying Bates (1999) "below the water paradigm," which stresses the importance of bringing to the surface salient relevant concepts that are commonly not recognizable. The model presents new perspectives by breaking down ICT into adjustable components that can be analyzed individually or collectively and still retain its wholeness.

Figure 1. A conceptual model of information communication technology ICT



The 'technology' components of ICT are the wired and wireless technologies and represented by the use of computers or hand-held-devices (cellphones), respectively. The composition signifies to Murdock (2002) an internal and external differential with a third aspect representing information. Communication can be established either with a mobile network or fixed network (internet broadband). As the model reveals, ICT entails the "utilization of information with available technology and accessible means of communication." In other words, represented by mobile network (using hand-held-devices/ cellphones/ tablets) or fixed-broadband network (using computers), respectively.

Digital Divide Concerns

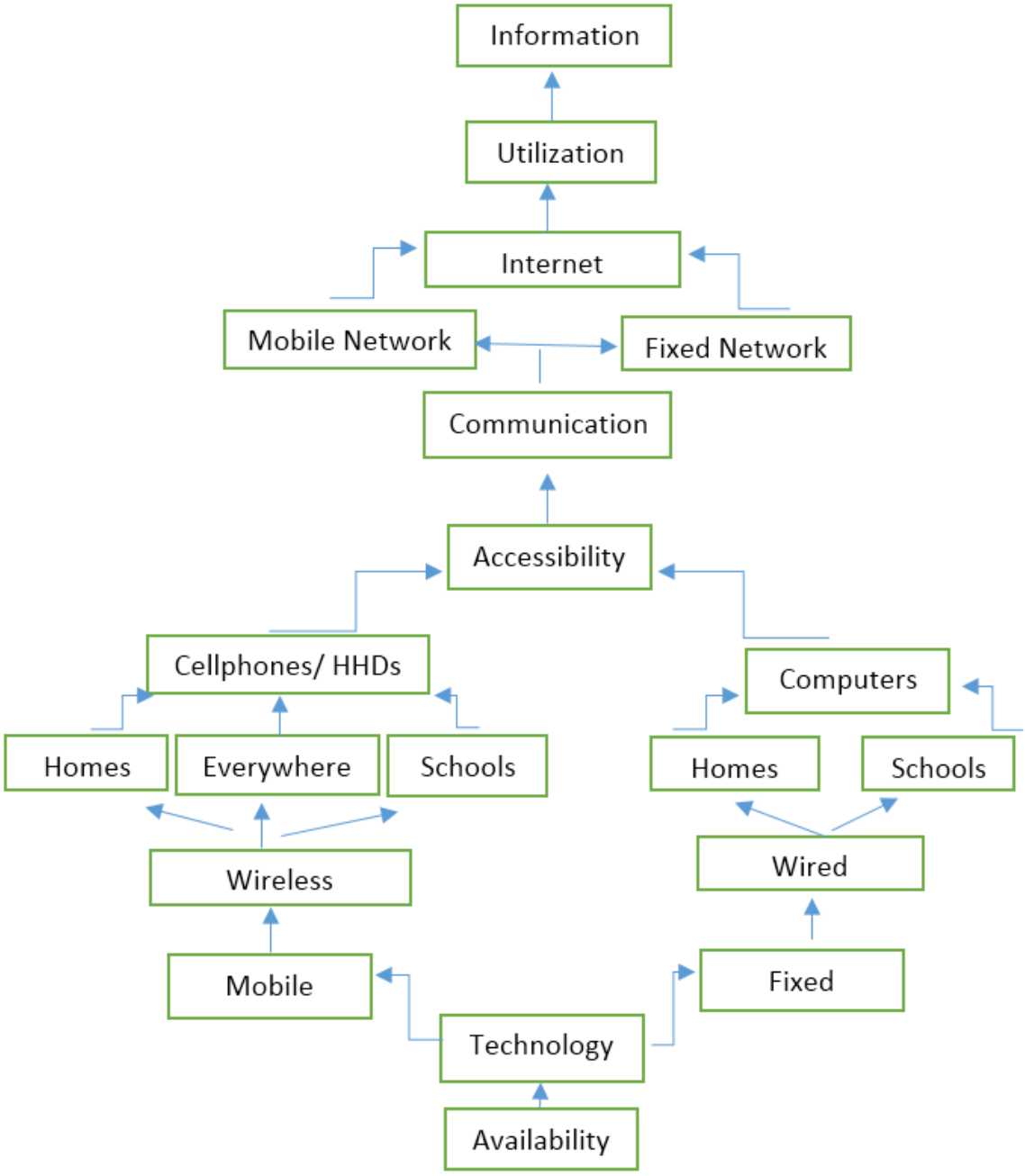
Digital divide has been framed to explain difficulties associated with the equitable distribution and use of ICT among citizens regardless of geographical locations. It is a factor with multiple appearances and attributes, which prevent a uniform definition due to the very nature of ICT in particular. Regarding the attention that the digital divide issues have received, Mariscal (2005) explained that "there is no consensus regarding the appropriate policy to implement, if any at all".

Van Dijk (2006) describes digital divide as the unequal distribution of access to information communications technology (ICT) between society's 'haves' and 'have-nots.' Abramson (2006) describes digital divide as the gap between people with and without computer and internet access. Others described digital divide to include both technological and human expertise necessary for the meaningful application of ICT (Servon, 2002; Attewe, 2001; Hesseldah, 2008; Dimaggio and Hargittai, 2001). Similarly, Honlfeld, Ritzhaupt, Barron and Kember (2008) summarized digital divide as a multilayered phenomenon.

Whatever perspective one chooses to approach digital divide with circumvents around interpretation ascribed to the unmet ICT needs of the people. Hence, it is an interdisciplinary issue with common identifiable attributes bothering on the utilization of information mediated by ICT.

The core issue with digital divide hinges the position of the evaluators on the components that combines and constructs ICT. This explains the different definitions of digital divide and the various perspectives such as: content based digital divide (Attewell, 2001; Van Dijk, 2006), internet access differentials (Murdock, 2002), and the sensible use of ICT (Kim and Kim, 2001).

Figure 2. Structure of ICT and stages of possible digital divide occurrences.



On the ICT tree digital divide may occur in any or on all three stages of (i) availability, (ii) accessibility, and (iii) utilization. However, while the stages of availability of technology and accessibility of communication network points towards ICT infrastructure, the stage of utilization emphasizes more on needed skills and expertise to meaningful manipulation of the technology. This is interesting to articulate in order for specialized programs of bridging digital divide to materialize. A well understood ICT will clarify digital divide and make the inclusion process easier and diffusion possible. Ambiguity is dissolved with the aid of simplification of the factors responsible for ICT differentials and digital divide in schools in African countries.

Despite evidence of poor use of landlines (fixed network) use in Africa compared to countries like the United States, Canadian and British cellphone use is rapidly closing up divide among students in those two regions. Hence, the growing mobile network in African countries enables students to use mobile phones in bridging the digital divide instead of using landlines or broadband internet connection based on a 2015 Pew Research Center analysis. All indicators point in the direction of mobile network as championing ICT revolution per trends in landlines (fixed) and mobile network are compared. The model guides practical analysis for best ICT practice in Africa that allows countries to formulate ICT policies by taking into account factors that lead to failed projects to allow for cost effectiveness and encourages collaboration.

Factors Expanding Digital Divide in African Countries

Among the numerously different factors contributing to digital divide on the African continent, the cost of ICT has been a major concern on how to successfully transform African countries into a digitally literate continent where information is accessible to every citizen. As developed countries have kept the cost of ICT under control to enable equipping schools with computers and internet connection, African countries are still unable to provide computers and internet access in schools due to an ever increasing cost of acquiring ICT infrastructures. Nigeria's over 6,000 public schools lack minimal basic classroom amenities such as books, pencils and chalkboards (Aduwa-Ogiegbaen and Iyamu (2005). Ordinarily, schools and the school population cannot provide this infrastructure themselves due to exorbitant computer and internet connection fees (p. 106). The inability of African countries to manufacture ICT infrastructure is a major contributor to the high cost of importing ICT and foreign expatriate services. Basically, countries in Africa are incapable, even with the most "substandard technology infrastructures," to provide ICT in schools. African countries lack both human and material resources needed to curb digital divide and enforce digital diffusion in their schools.

Human and material resources are factors that contribute to digital divide in schools in African countries. To keep ICT functioning requires capable hands and enabling infrastructures, and these have to be on ground at all times to prevent all forms of interruption to services rendered. Schools are expected to make available material resources that support ICT and these resources need professionals that can handle them and provide technical satisfaction to both schools and students. The human resource provides technical support to computers and internet so that learning systems can be implemented (Hwang, 2014). The idea of "technology-enhanced learning" is based on equipping schools with ICT to achieve a "smart learning environment" where students enjoy equal access to ICT services. Basically, providing ICT in schools and ensuring that digital resources are utilized by students involves the right tools such as guided learning, active participation of instructors, and necessary hints or suggestions (p.2). The implementation of ICT in schools should adopt a systematic approach unfolding the merits and demerits including methods of skills acquisition training for instructors on emerging technology, especially if the technology requires certain levels of operational expertise. Generally, change creates an atmosphere of uncertainty at the workplace and in the people a tendency to resist innovation.

The fear for change due to stagnation increases digital divide in Africa. No doubt innovation brings about change while the uncertainties that come with change evokes resistance in the people to accept innovation. Due to uncertainties accompanying change, both employers and employees fear for their organization or are afraid of losing their jobs. When schools are adequately equipped with ICT and supportive learning technologies, the first time user (both staff and students) are overwhelmed by the aura of change and strangeness. The uncertainty that accompanies change evokes in the people the psych to resist the change, when ordinarily, as a collective they are fascinated by the change and the opportunities the innovation provides. This natural perception of change as threat to status quo contributes to resistance to innovation within an organization such as schools. Unfamiliarity with technology forms barriers to the usage of ICT as a result of awareness, cumbersome platforms (Connaway & Wicht, 2007, p. 5). Truly, change is not given appropriate support to develop in Africa and the digital divide in schools continues to grow within countries. Consequently, the need to persist with change and implement measures of sustaining the innovation of technology mediated learning is paramount for both internal and external advancement of African countries educationally. However, to effectively introduce innovation requires proper management mechanisms capable of developing strategic policies to sustain the innovation.

Mismanagement has created an institutional mechanism injected with obsolete ideologies, making the system unable to strategically plan a way out for African countries' ICT predicament. This common scenario cuts across African countries as evidence of failed and abandoned educational projects due to lack of strategic planning and proactive management. There is a big difference between management and leadership (Hoggan and Bodrero, 2003), with later missing within the management structure in Africa and possibly a major reason policy makers are unable to create sustainability measures to handle the high rate of failed, unaccountable and uncompleted projects. Their poor and awkward managerial style subject schools in African countries to moribund instructional pedagogy opposed to educational trajectory re-positioned by the exponential growth of ICT. Schools need management capable of formulating strategies for adopting, implementing, and sustaining ICT within the framework of innovative educational pedagogy. Most educational reforms in African countries, such as the Education Sector Report of Nigeria (Saint, Hartnett and Strassner, 2003), reveal how amateurs lacking global perspective on ICT powered education trajectory determine the future of educational pedagogy with stagnating policies. Hwang, Hung, Cheng, and Liu (2014) suggest that such challenges require a comprehensive description and the right tools. Countries need the right management to tackle digital divide through policies, not the Nigerian education reforms committee, but educational committees comprised of proactive individuals capable of formulating strategic policies to prevent the digital divide from sabotaging the digital inclusion and diffusion effort promoted by poor framework for adopting ICT.

Another factor inherent in socio-political and cultural policies of African countries is 'sectional values.' This silent monster has penetrated virtually all African countries ridiculing progressive orientation while cultivating nepotism as a priority of the power mongering ruling class. The "federal character" system in Nigerian civil service shows how regions within the same unit deliberately deny developmental and infrastructural amenities under the guise of enforcing uniform development across the country. It is common among African countries for the ruling class to usurp the socio-economic and political might to confuse balance, promote mediocrity, and crucify the principles of merit on the altar of sectional values of otherwise tribal and religious biases. Considering the education system in Nigeria, Adamolekun, Erero and Oshionebo (1991) decry the possibilities of achieving a collective rehabilitation of schools for effectiveness because they suffer adversely from the consequences of 'Federal Character' policy. The problems linger today and remain a major contributor to digital divide in schools in African countries. Lack of efficiency and effectiveness is responsible for both government inabilities to tackle digital divide as and when due. Bureaucratic practices by governments in African countries contribute immensely to escalating problems as well as their solutions. Considering the political ramifications surrounding implementation of ICT policies (Qureshi, 2009), schools are thrown into the oblivion of digital divide because no practical solutions are emerging from government policies ridiculed with unnecessary bureaucracies.

Conclusion

This paper has presented evidence that digital divide still pervades schools in African countries despite efforts of governments in providing ICT infrastructures and the peoples' utilization of available technology to enable digital diffusion. This arises from the fact that digital divide is not narrowed down to any single concept, idea or manifestation. Globally, ICT penetration in schools and pedagogy has recorded increases this past decade, yet African countries still lag behind deploying adequate measures to tackle digital divide and sustain diffusion. Students use of mobile devices as a result of mobile network penetration in most African countries does not reflect digital diffusion when compared to schools in developed countries. Evidence of unequal ICT distribution in countries of Africa is no longer the leading factor promoting digital divide and technology penetration in their schools.

African countries battle pertinent factors of digital divide other than those acknowledged globally within the areas of unequal ICT distribution to meaningful manipulation of its associated infrastructures. Hatlevik et al. (2015) notes a difficulty in addressing digital divide due to dented equal opportunity for all students use of ICT in schools for academic performance regardless of their access to technology. As a result of peculiar factors, African countries face complicated challenges outside those originally addressed by digital inclusion. Unfortunately, we find within the purview of education a high level of nepotism, mismanagement of resources, and a lack of innovative policies by persons in position of authority as factors escalate the digital divide in schools in Africa.

According to Ford and Whaley (2003), widespread discrimination has contributed significantly to the problems of ICT penetration and the growing digital divide in African schools. These factors joined together to continue to complicate all efforts in tackling digital divide as well as spreading complacency throughout Africa. Countries should support grass-root development through ICT involvement in schools (Boast, Bravo and Srinivasan, 2007). Furthermore, information communication technology is shaping the educational trajectory to meet the needs of the students. Educational pedagogy should receive the right technology boost in Africa to enable schools to bridge digital divide and enable diffusion for all students. Hatlevik et al. (2015) has demonstrated the union of digital competence and academic performance to be in agreement. Therefore, African countries need competent measures to handle the problems of ICT cost, national stagnation, and poor management to enable students enjoy the trajectory of education diffused in technology.

Finally, more research is needed in order to identify more factors militating against digital diffusion in schools all over Africa. Students' success in schools would benefit from pedagogical practices enabled to take full advantage of ICT (Hatlevik et al., 2015). This confirms the need for an educational revolution in Africa that sets the trajectory of pedagogy in the right direction of technology. Nevertheless, digital inclusion for schools in African countries should adopt a global perspective stressing the gains modern educational pedagogical trajectory embedded in digital diffusion. The key is uncovering factors promoting digital divide and finding sustainable solutions to ameliorate ICT in schools. Digital diffusion in schools is imperative to bridge the digital divide. Therefore, using a model framework to demonstrate the composition of ICT into components that can be dismantled and reassembled creates a perspective for the emergence of new knowledge about the evolutionary nature and conditions of digital divide.

References

Abramson, B.D. (2006). Word matters: Multicultural perspectives on information societies – by Alain Ambrosi, Vale´rie Peugeot, & Daniel Pimienta. Journal of Communication, 56(3), 627 628. doi: 10.1111/j.1460-

2466.2006. 00305.x
Adamolekun, L., Erero, J., & Oshionebo, B. (1991). "Federal Character" and Management of the Federal Civil Service and the Military. *Publius: The Journal of Federalism*, *21*(4), 75-88.
Aduwa-Ogiegbaen, S. E., & Iyamu, E. O. S. (2005). Using information and communication technology in secondary schools in Nigeria: Problems and prospects. *Educational Technology & Society*, *8*(1), 104-112.
Anderson, L. S. (1999). *Technology planning*: *It's more than computers*. National Center for Technology Planning. Retrieved from www.nctp.com
Attewell, P. (2001). Comment: The first and second digital divides. *Sociology of education*, *74*(3), 252- 259.
Bates, M. J. (1999). The invisible substrate of information science. *Journal of the Association for Information Science and Technology*, *50*(12), 1043.
Becker, H. (1986). Computers in the schools. A Recent update. Classroom Computer Learning, January, 96-102.
Boast, R., Bravo, M., & Srinivasan, R. (2007). Return to Babel: Emergent diversity, digital resources, and local knowledge. *The Information Society*,*23*(5), 395-403.
Burnett, G. (1994). Technology as a tool for urban classrooms. ERIC/CUE Digest, 95, New York: Eric Clearing house on Urban Education, retrieved December 21, 2004, from http://www.ericdigests.org/1994/tool.htm.
Carlson, S., & Firpo, J. (2001). Integrating computers into teaching: Findings from a 3-year program in 20 developing countries. In L. R Vandervert, L. V. Shavinina & R. A. Cornell (Eds.), Cyber education: The future of Distance Learning. Larchmont, NY: Mary Ann Liebert, Inc, 85114.
Connaway, L. S., & Wicht, H. L. (2007). What Happened to the E-book Revolution? Gradual Integration of E-Books into Academic Libraries. *Journal of Electronic Publishing, 10*(3).
Dabalen, A., & Oni, N. (2000). Labour market prospects for university graduates in Nigeria. World Bank Report on Nigeria University system innovation project.
Dimaggio, P., & Hargittai, E. (2001). From the 'digital divide' to 'digital inequality': Studying Internet use as penetration increases. Princeton, NJ: Center for Arts and Cultural Policy Studies, Woodrow Wilson School, Princeton University. Servon, L.J. (2002). Bridging the digital divide: Technology, community, and public policy. Malden, MA: Blackwell Publishing.
Fitzgerald, G., & Werner, J. (1996). The use of the computer to support cognitive behavioral interventions for students with behavioral disorders. Journal of Computing in Childhood Education, 7, 127-48.
Ford Jr, D. L., & Whaley, G. L. (2003). The digital divide and managing workforce diversity: A commentary. *Applied Psychology*, *52*(3), 476-485.
Harper, D. O. (1987). The creation and development of Educational computer technology. In R.
M. Thomas & V. N. Kobayashi (Eds.), Educational technology: its creation, development and cross-cultural transfer, Oxford: Pergamon Press, 35-63.
Hatlevik, O. E., Guðmundsdóttir, G. B., & Loi, M. (2015). Digital diversity among upper secondary students: A multilevel analysis of the relationship between cultural capital, self efficacy, strategic use of information and digital competence. *Computers & Education*, *81*, 345-353.
Hesseldahl, A. (2008). Bringing broadband to the urban poor. *BusinessWeek. com*, *31*.
Hohlfeld, T. N., Ritzhaupt, A. D., Barron, A. E., & Kemker, K. (2008). Examining the digital divide in K-12 public schools: Four-year trends for supporting ICT literacy in Florida. *Computers & Education*, *51*(4), 1648-1663.
Hoggan, D. B. (2003). Faculty status for librarians in higher education. *portal: Libraries and the Academy*, *3*(3), 431-445.
Hwang, G. J. (2014). Definition, framework and research issues of smart learning environments-a context aware ubiquitous learning perspective. *Smart Learning Environments*, *1*(1), 1.
Hwang, G. J., Hung, P. H., Chen, N. S., & Liu, G. Z. (2014). Mindtool-Assisted In-Field Learning (MAIL): An Advanced Ubiquitous Learning Project in Taiwan. *Educational Technology & Society*, *17*(2), 4-16.
Kim, M. C., & Kim, J. K. (2001). Digital divide: Conceptual discussions and prospect. In *The Human Society and the Internet Internet-Related Socio-Economic Issues* (pp. 78-91).
Springer Berlin Heidelberg. K-12 public schools: Four-year trends for supporting ICT literacy in Florida. *Computers & Education*, *51*(4), 1648-1663.
Kuhlthau, C. C. (1994). Students and the information search process: Zones of intervention for librarians. *Advances in librarianship*, *18*, 57-72.
Malapile, S., & Keengwe, J. (2014). Information communication technology planning in developing countries. *Education and Information Technologies*,*19*(4), 691-701.
Mariscal, J. (2005). Digital divide in a developing country. *Telecommunications policy*, *29*(5), 409-428.
Murdock, G. (2002). Review Article: Debating Digital Divides Benjamin M. Compaine (ed.), The Digital Divide: Facing a Crisis or Creating a Myth? Cambridge, MA: MIT Press, 2001. 357 pp. Pippa Norris, Digital

Divide: Civic Engagement, Information Poverty, and the Internet Worldwide. Cambridge: Cambridge University Press, 2001. 303 pp. Anthony G.

Wilhelm, Democracy in the Digital Age: Challenges to Political Life in Cyberspace. New York and London: Routledge, 2000. 184 pp. *European Journal of Communication*,*17*(3),385-390.

Oguz, F. (2016). Organizational influences in technology adoption decisions: A case study of digital libraries. *College & Research Libraries*, *77*(3), 314-334.

Okebukola, P. (1997). Old, new and current technology in education. UNESCO Africa, 14 (15), 7-18.

Qureshi, S. (2009). Assessment of the social factors in information and communication technology access and use. Information Technology for Development, 15(4), 235–236.

Rosen, L., & Michelle, W. (1995). Computer availability, computer experience and technophobia among public school teachers. Computer in Human Behaviour, 11, 9-31.

Saint, W., Hartnett, T. A., & Strassner, E. (2003). Higher education in Nigeria: A status report. *Higher education policy*, *16*(3), 259-281.

Sink, D. W., Jackson, K. L., Boham, K. A., & Shockley, D. (2004). The western North Carolina technology consortium: A collaborative approach to bridging the digital divide. *Community College Journal of Research and Practice*, *28*(4), 321-329.

Thierer, A. (2000). Divided over the digital divide, Washington, DC: Heritage Foundation.

Van Dijk, J. A. (2006). Digital divide research, achievements and shortcomings. *Poetics*, *34*(4), 221-235.

Vanderlinde, R., & van Braak, J. (2010). The e-capacity of primary schools: Development of a conceptual model and scale construction from a school improvement perspective. *Computers & Education*, *55*(2), 541-553.

Vandenbroeck, M., Verschelden, G., Boonaert, T., & Haute, L. V. (2007). Changes in the digital divide: a case from Belgium. *British Journal of Educational Technology*, *38*(4), 742-743.

Visscher, A., Wild, P., Smith, D., & Newton, L. (2003). Evaluation of the implementation, use and effects of computerized management information system in English secondary schools.

British Journal of Educational Technology, 34 (3), 357-366.